

What is claimed is:

1 1. A semiconductor wafer cleaning apparatus comprising:
2 a loading unit having a cassette loaded thereon, a plurality of semiconductor
3 wafers being mounted on the cassette;
4 a moving mechanism that extracts the semiconductor wafers mounted on the
5 cassette of the loading unit and moves the extracted semiconductor wafers into a
6 loader spaced apart from the loading unit;
7 an inner bath spaced apart from the loader, in which the semiconductor wafers
8 are cleaned with a cleaning solution;
9 a marangoni dryer including a hood, that moves the semiconductor wafers from
10 the loader into the inner bath, the marangoni dryer movable in $\pm X$ -, $\pm Y$ -, and $\pm Z$ -
11 directions to be tightly sealed to the inner bath; and
12 a knife that supports the semiconductor wafers loaded into the inner bath at a
13 lower portion of the inner bath, and moves the semiconductor wafers up and down.

1 2. The semiconductor wafer cleaning apparatus according to claim 1,
2 wherein the moving mechanism comprises:
3 a pad that extracts the semiconductor wafers from the cassette;
4 a first moving element including a revolving body, that rotates and thereby
5 elevates the extracted semiconductor wafers extracted by the pad; and
6 a second moving element that moves the semiconductor wafers rotated upward
7 by the first moving element into a loader.

1 3. The semiconductor wafer cleaning apparatus according to claim 2,
2 wherein the second moving element comprises:
3 a clutch movable in the $\pm X$ -, $\pm Y$ -, and $\pm Z$ -directions, that picks up the
4 semiconductor wafers rotated and elevated by the first moving element; and

5 rails movable in the $\pm X$ -, $\pm Y$ -, and $\pm Z$ -directions, that move the semiconductor
6 wafers picked-up by the clutch into the loader.

1 4. The semiconductor wafer cleaning apparatus according to claim 1,
2 wherein the loader includes a pusher that raises and lowers the mounted
3 semiconductor wafers so that the marangoni dryer picks up the semiconductor wafers.

1 5. The semiconductor wafer cleaning apparatus according to claim 1,
2 wherein the hood of the marangoni dryer includes slots and a locking unit that hold the
3 semiconductor wafers, the marangoni dryer further comprising:

4 a drying solution supply plate having a plurality of holes so that the drying
5 solution is uniformly sprayed onto the mounted semiconductor wafers in the hood; and
6 a drying solution supply nozzle installed on the drying solution supply plate.

1 6. The semiconductor wafer cleaning apparatus according to claim 5,
2 wherein the drying solution comprises isopropyl alcohol.

1 7. The semiconductor wafer cleaning apparatus according to claim 1,
2 wherein the inner bath comprises:

3 recess portions formed in both sidewalls of the inner bath; and
4 outer baths installed at both sides of the inner bath, aligned with the recess
5 portions.

1 8. The semiconductor wafer cleaning apparatus according to claim 7, further
2 comprising exhaust lines installed at rear walls of the outer baths, that uniformly
3 exhaust the outer baths.

1 9. The semiconductor wafer cleaning apparatus according to claim 1,
2 wherein the cleaning solution comprises a chemical solution or deionized water.

1 10. A method of cleaning a semiconductor wafer comprising:
2 loading a cassette into a loading unit, the cassette holding a plurality of
3 semiconductor wafers;
4 extracting the semiconductor wafers held on the cassette of the loading unit;
5 moving the extracted semiconductor wafers into a loader spaced apart from the
6 loading unit;
7 mounting the semiconductor wafers from the loader into a marangoni dryer;
8 moving the marangoni dryer including the semiconductor wafers mounted
9 therein, into an inner bath spaced apart from the loader;
10 moving the semiconductor wafers from the marangoni dryer into the inner bath;
11 cleaning the semiconductor wafers in the inner bath with a cleaning solution;
12 lowering the marangoni dryer to be closely adhered and sealed to the inner bath;
13 and
14 lifting the semiconductor wafers from the inner bath containing the cleaning
15 solution while drying solution fumes are sprayed from a top of the marangoni dryer, so
16 that the cleaning solution is removed from the semiconductor wafers using a difference
17 in surface tension between the drying solution and the cleaning solution.

1 11. The method according to claim 10, wherein said mounting comprises
2 moving the loader with a pusher installed under the loader, to move the semiconductor
3 wafers into the marangoni dryer for mounting.

1 12. The method according to claim 10, wherein said lifting comprises lifting
2 the semiconductor wafers with a knife installed in a bottom portion of the inner bath.

1 13. The method according to claim 10, wherein the cleaning solution
2 comprises a chemical solution or de-ionized water, and the drying solution comprises
3 isopropyl alcohol.

1 14. The method according to claim 13, wherein nitrogen is also sprayed from
2 the top of the marangoni dryer during said lifting.

1 15. A method of cleaning a semiconductor wafer comprising:
2 loading a cassette into a loading unit, the cassette holding a plurality of
3 semiconductor wafers;
4 extracting the semiconductor wafers held on the cassette of the loading unit;
5 moving the extracted semiconductor wafers into a loader spaced apart from the
6 loading unit;
7 mounting the semiconductor wafers from the loader into a marangoni dryer;
8 moving the marangoni dryer including the semiconductor wafers mounted
9 therein, into an inner bath spaced apart from the loader;
10 moving the semiconductor wafers from the marangoni dryer into the inner bath;
11 cleaning the semiconductor wafers in the inner bath with a cleaning solution;
12 lowering the marangoni dryer to be closely adhered and sealed to the inner bath;
13 and
14 slowly draining the cleaning solution from the inner bath while drying solution
15 fumes are sprayed from a top of the marangoni dryer, so that the cleaning solution is
16 removed from the semiconductor wafers using a difference in surface tension between
17 the drying solution and the cleaning solution.

1 16. The method according to claim 15, wherein said slowly draining comprises
2 uniformly exhausting the inner bath via an exhaust line installed in outer baths mounted
3 at both sides of the inner bath.

1 17. The method according to claim 15, wherein the cleaning solution
2 comprises a chemical solution or de-ionized water, and the drying solution comprises
3 isopropyl alcohol.

1 18. The method according to claim 17, wherein nitrogen is also sprayed from
2 the top of the marangoni dryer during said draining.

1 19. A semiconductor wafer cleaning apparatus comprising:
2 a bath that contains a cleaning solution;
3 a marangoni dryer including a hood, the marangoni dryer being movable to pick
4 up semiconductor wafers loaded in a cassette and being movable to transport the
5 picked up semiconductor wafers to the bath and so that the hood is tightly sealed to the
6 bath; and
7 a supply mechanism that uniformly provides a drying solution to the
8 semiconductor wafers from an upper portion of the hood, when the marangoni dryer is
9 tightly sealed to the bath.

1 20. The semiconductor wafer cleaning apparatus of claim 19, wherein the
2 cleaning solution comprises a chemical solution or deionized water, and the drying
3 solution comprises isopropyl alcohol.